

TERMINATION CRITERIA FOR THE ONE-DIMENSIONAL INTERVAL VERSION OF NEWTON'S METHOD

ABSTRACT

One embodiment of the present invention provides a system for finding zeros of a function, f , within an interval, X , using the interval version of Newton's method. The system operates by receiving a representation of the interval X . This representation including a first floating-point number, a , representing the left endpoint of X , and a second floating-point number, b , representing the right endpoint of X . Next, the system performs an interval Newton step on X , wherein the point of expansion is the midpoint, x , of the interval X . Note that performing the interval Newton step involves evaluating $f(x)$ to produce an interval result $f^I(x)$. If $f^I(x)$ contains zero, the system evaluates $f(a)$ to produce an interval result $f^I(a)$. It also evaluates $f(b)$ to produce an interval result $f^I(b)$. The system then evaluates a termination condition for the processing of the current interval X , wherein the termination condition is TRUE if a number of sub-conditions are satisfied, including if $f^I(a)$ contains zero and if $f^I(b)$ contains zero. If the termination condition is TRUE, the system terminates the processing of the current interval X , and records X as a final bound.